

# Flood Hazards, Risk, and Resilience

**Danielle Swallow**

**Coastal Hazards Specialist, Delaware Sea Grant**

**May 12, 2023**

INSTITUTE FOR PUBLIC ADMINISTRATION | IPA



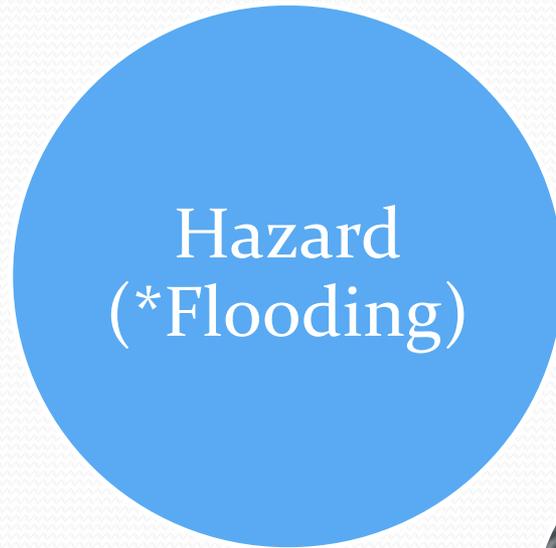
UNIVERSITY OF DELAWARE  
BIDEN SCHOOL OF PUBLIC  
POLICY & ADMINISTRATION

**Sea**  
**Grant**  
DELAWARE



DELAWARE DEPARTMENT OF  
NATURAL RESOURCES AND  
ENVIRONMENTAL CONTROL

# Understanding Flood Risks



Heavy  
Precipitation  
Events



Coastal  
Storms



Tidal



Sea Level  
Rise

# Coastal Storms



October 29, 2021 in Dewey Beach, DE credit: Ellen Driscoll, Cape Gazette

# Heavy Precipitation Events



Newark, DE, 2016

# Tidal Flooding



\*Source: NOAA State of High Tide Flooding and 2022 Annual Outlook

[https://tidesandcurrents.noaa.gov/HighTideFlooding\\_AnnualOutlook.html](https://tidesandcurrents.noaa.gov/HighTideFlooding_AnnualOutlook.html)

## Lewes, DE

Year	Flood Days
------	------------

2021	13
------	----

### Projected High Tide Flood Days

Year	Flood Days
------	------------

2022	8 - 13
------	--------

2050	60 - 90
------	---------

Average No. of flood days in 2000: 4  
Record No. of flood days: 15

*Flood threshold is 0.56m above MHHW*

## Reedy Point, DE

Year	Flood Days
------	------------

2021	6
------	---

### Projected High Tide Flood Days

Year	Flood Days
------	------------

2022	2 - 5
------	-------

2050	35 - 65
------	---------

Average No. of flood days in 2000: 1  
Record No. of flood days: 5

*Flood threshold is 0.57m above MHHW*

# Sea Level Rise



Source: Massachusetts Audubon Center

Appears as an increase in average tide height over time

# More Damaging Flooding and Erosion Expected

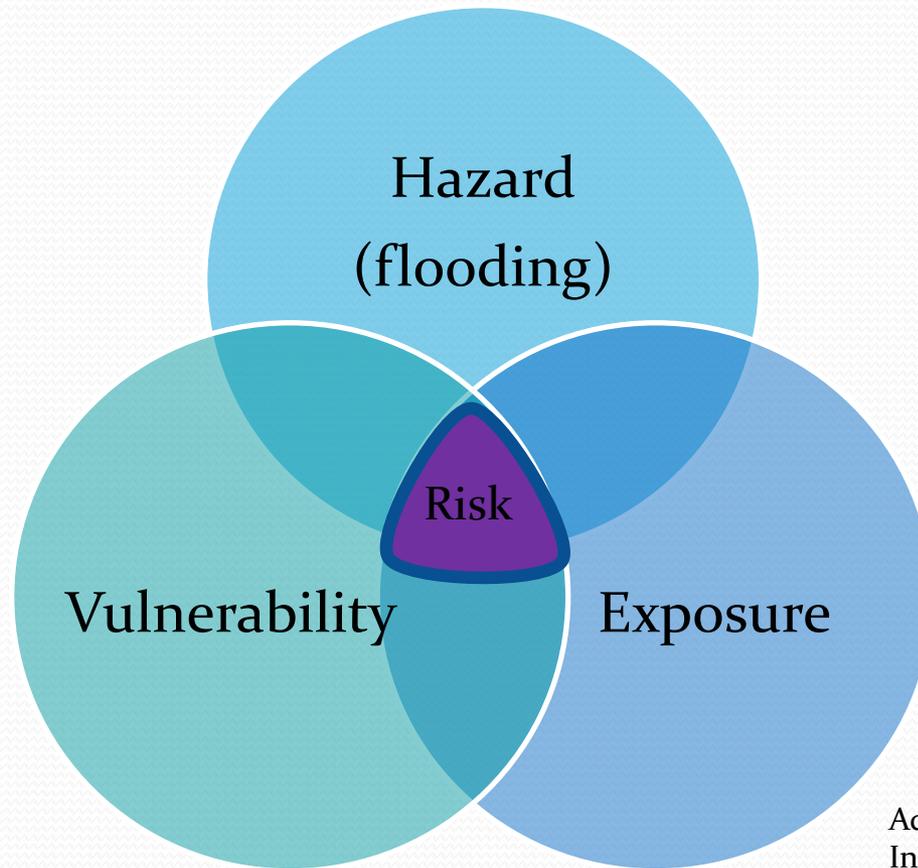
*Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. By 2050, “moderate” (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors. – NOAA Sea Level Rise Technical Report*

# Planning With Uncertainty



- Uncertainty is inherent in science and policy-making
- Ignoring it conceals risks and undermines risk management
- Not including some wiggle room increases the potential for maladaptation
- Flexible, adaptive management allows course corrections

# Risk = Hazard + Exposure + Vulnerability

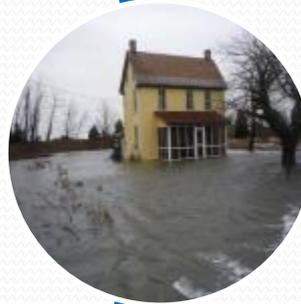


Adapted from FEMA, IS-393.A  
Introduction to Hazard Mitigation

# Exposure



People



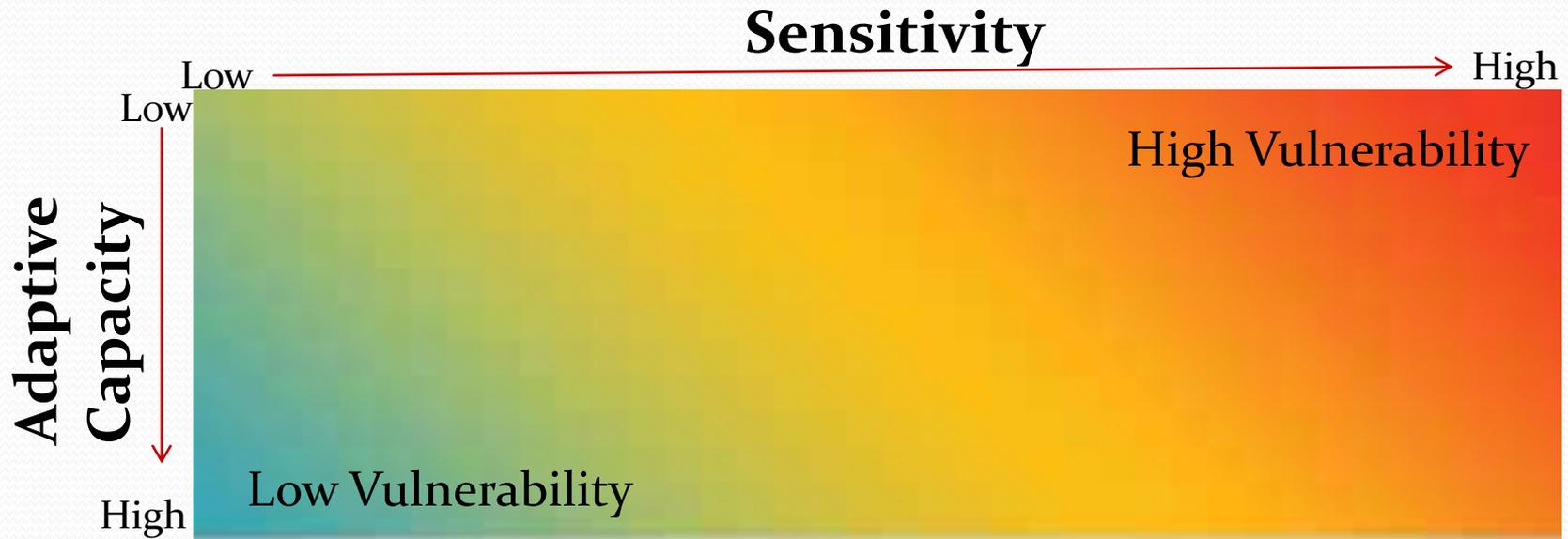
Property



Natural & Built  
Infrastructure



Adapted from FEMA, IS-393.A  
Introduction to Hazard Mitigation



Graphic courtesy of Daniella Hirschfeld, The Resiliency Place

Sensitivity and Adaptive Capacity are important considerations for Vulnerability

# Resilience:

The ability to bounce back after disruptive events



Wilmington, DE



How long before life returns to “normal?”

# Resilience and Sustainability Requires a Comprehensive Approach to Planning



# Resiliency Planning Tips

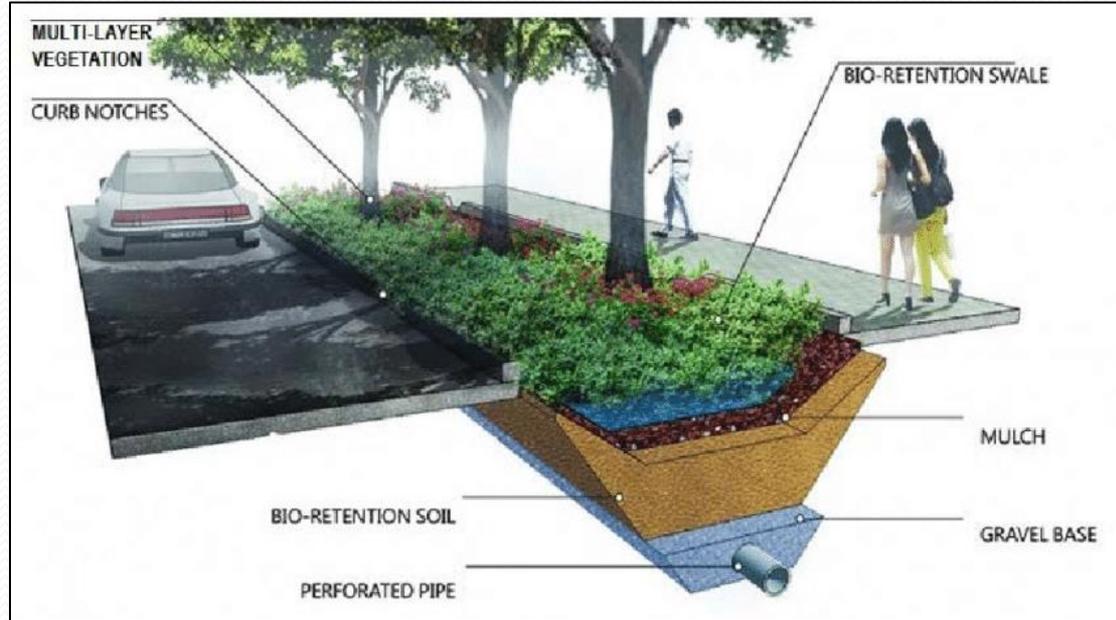
- Assess the hazard and what is most at risk
  - Today and in the future
- What is the timeframe and scenarios you are planning to?
- Which assets are the top priority for mitigation and adaptation?
  - What options does your town have most control over?
- What are the community's values and needs vs. wants?
- How can the town best position itself to meet future needs?

# Resiliency Planning Tips, continued...

- Document findings
- Engage the public early and often
  - Educate and inform
  - How much risk are they willing to live with?
  - Find partners
- Identify mitigation & adaptation options that reduce exposure and vulnerability
  - Let science and best practices inform your approach
- Adopt higher standards
- Get started now



# Accommodate



# Protect

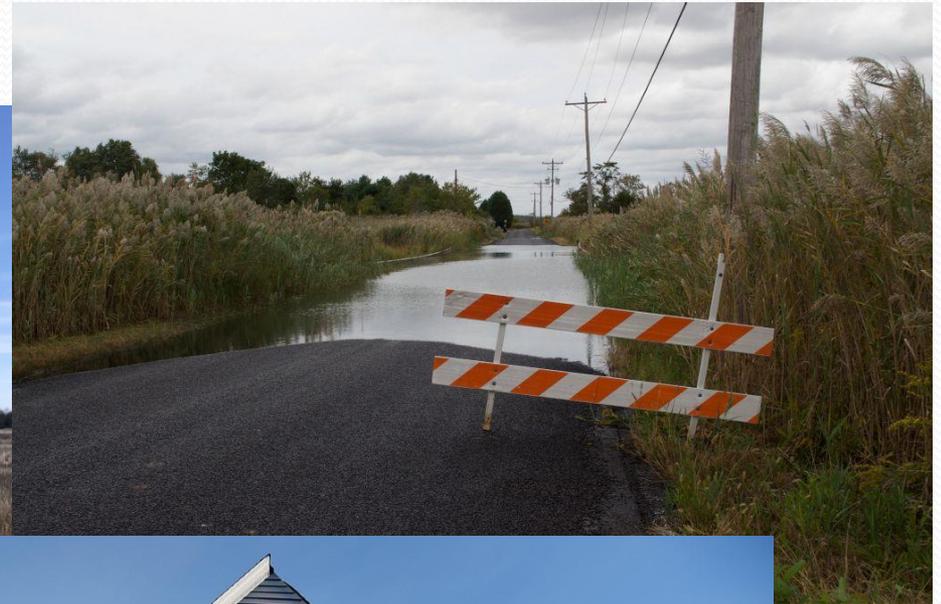


# Avoid



Open space  
preservation

# Retreat



Old  
Corbitt  
Road

Home  
demolition

# Invest in Our Civic and Social Infrastructure



- Identify vulnerable populations and their proximity to services
- Expand social services to address gaps
- Transfer the benefits of sustainability and resilience initiatives to disadvantaged groups
- Support social networks and disaster response and recovery groups
- Establish local resilience and sustainability funds
- Encourage the hiring of staff with specific skill sets

# Potential Resiliency Tools

Building codes and ordinances

Nature-based solutions

Designing/retrofitting infrastructure to higher standards

Robust emergency operations and recovery planning

Building redundancy into critical town operations

Monitoring conditions and gathering data

Resilience fund or capitol improvement fund

Town staff with skills to carry out resilience planning

Education and outreach

Social and professional networks

For ideas, turn to: Maryland CoastSmart Communities Scorecard

<http://dnrweb.dnr.state.md.us/CoastSmart/pdfs/scorecard.pdf>

# Thank You!

*dswallow@udel.edu*

